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DEFENSE SYSTEMS MANAGEMENT SCHOOL FORT BELVOIR VA
THE IMPACT OF INCREASED EMPHASIS OF TEST AND EVALUATION ON THE --ETC(U)
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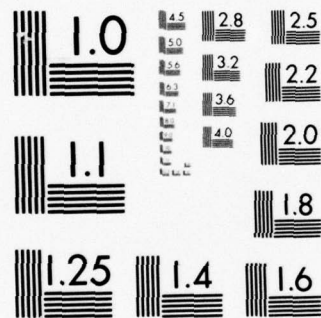
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DEFENSE SYSTEMS *MANAGEMENT SCHOOL*



Program Management Course Student Study Program

THE IMPACT OF INCREASED
EMPHASIS OF TEST AND
EVALUATION ON THE
ACQUISITION OF THE U.S.
NAVY S-3A ASW AIRCRAFT
PMC 73-2

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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: The Impact of Increased Emphasis of Test and Evaluation on the Acquisition of the U.S. Navy S-3A ASW Aircraft

STUDY PROBLEM/QUESTION:

What is the effect of the contract, cost schedule and quality of data by accomplishing operational test and evaluation of the S-3A aircraft earlier than originally scheduled?

STUDY REPORT ABSTRACT:

The acquisition of the S-3A aircraft had been in process almost four years when the requirement to conduct operational test and evaluation commencing with the initiation of development test and evaluation was imposed on the project. The evolution of this requirement was briefly discussed as was the resulting problem.

After discussing the effect of conducting concurrent development testing and operational testing, it was concluded that the initiation of early operational testing had no effect on the basic contract, resulted in only a slight increase in program cost and was accomplished with only a minor revision to the contract schedule. It was also concluded that a possible lack of coordination between test agencies caused conflicting conclusions based on the results of conducting concurrent testing.

Problem

KEY WORDS: MATERIEL ACQUISITION AIRCRAFT S-3A
EVALUATION TECHNIQUES CONTRACT MANAGEMENT
ANTISUBMARINE WARFARE OPERATIONAL TESTING

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THE IMPACT OF INCREASED EMPHASIS OF TEST
AND EVALUATION ON THE ACQUISITION OF THE
U.S. NAVY S-3A ASW AIRCRAFT .

⑦ *Student*
Project rept.,

An Executive Summary
of a
Study Report
by

⑩
Robert Lawrence/Brace
Commander, U.S. Navy

⑪ 19 Nov ~~1973~~ 1973

⑫ 35 p.

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Program Management Course
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Fort Belvoir, Virginia 22060

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EXECUTIVE SUMMARY

The purpose of this study was to determine the impact of increased emphasis on test and evaluation on the acquisition of the U.S. Navy S-3A antisubmarine warfare aircraft. The acquisition project had been in being almost four years and in contract almost two years when the Secretary of Defense promulgated explicit policy relating to the initiation of operational test and evaluation in the acquisition process as early as possible, on 13 July 1971. This requirement was thus imposed on the S-3A project. Data and information pertinent to measuring the effect of early initiation of operational test and evaluation on the contract, the cost, schedule and quality and consistency of data was acquired by conducting a literature search in the Defense Systems Management School Library, conducting interviews of various Department of Defense officials and an examination of unclassified documents held in the S-3A Project Office.

Some comments concerning the development of the requirement for incorporating operational test and evaluation early is presented as is a description of the problem thus specifically imposed on the S-3A project.

After discussing the effect of conducting concurrent development testing and operational testing, it was concluded that initiation of early operational testing had no impact on the basic contract, resulted in an increase in cost amounting to less than one percent

of the total estimated cost of acquisition and ownership and was accomplished by making a relatively minor revision to the original contractual schedule. It was also concluded that a possible lack of coordination between test agencies has resulted in conflicting conclusions derived from the results of the concurrent testing.

THE IMPACT OF INCREASED EMPHASIS OF TEST
AND EVALUATION ON THE ACQUISITION OF THE
U.S. NAVY S-3A ASW AIRCRAFT

STUDY REPORT

Presented to the Faculty
of the
Defense Systems Management School
in Partial Fulfillment of the
Program Management Course
Class 73-2

by

Robert Lawrence Brace
Commander U.S. Navy

November 1973

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There are others, too numerous to enumerate, who contributed to this study effort; from the Offices of the Deputy Director, Test and Evaluation Division (OP-983B), COMNAVAIRTESTCEN, COMOPTEVFOR and within the Naval Air Systems Command Headquarters. I am, however, appreciative of the guidance provided by my mentor and friend, Commander E. E. Guffey, U. S. Navy.

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THE IMPACT OF INCREASED EMPHASIS OF TEST
AND EVALUATION ON THE ACQUISITION OF THE
U.S. NAVY S-3A ASW AIRCRAFT

INTRODUCTION

The purpose of this study was to determine the impact of increased emphasis on test and evaluation on the acquisition of the U.S. Navy S-3A antisubmarine warfare aircraft. By July 1971, this program had been in planning for four years, in contract for two years and was eighteen months from first flight. Also in July 1971, a significant change in Department of Defense (DOD) policy concerning the acquisition of major defense systems became effective. This new policy provided, in part, for initiation of system operational test and evaluation as soon as possible. The policy statement did not specifically address application to programs in progress. However, coincident with promulgation of this new policy, the decision was made to conduct concurrent development and operational test and evaluation of the S-3A aircraft and its antisubmarine warfare avionics suite as soon as possible. This decision required a major revision of the Project Master Plan and impacted on virtually every facet of the program.

The data and information germane to this study were acquired by conducting a search of the pertinent literature contained in the

This study represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management School nor the Department of Defense.

Defense Systems Management School library, by conducting formal and informal interviews of various officials within the Department of Defense and by examination of relevant unclassified documents made available by the S-3A Project Office. Although this report is not intended to reflect any parochialism, the terminology used herein will generally be that common usage in the U.S. Navy. Also, the Army and Air Force have projects in progress which have been impacted by the new test and evaluation policy. Other than to confirm the observations which resulted from the study of the Navy's S-3A project, and then only through informal contact with a member of another service who was engaged in such a project, no attempt was made to study in depth any project except the S-3A.

The impact of conducting early operational test and evaluation on the S-3A weapon was determined, primarily subjectively, by analyzing the effect on the system acquisition contract, on cost and on schedule and by evaluating the quality and consistency of the results of the concurrent test and evaluation program.

THE REQUIREMENT

The names of most prominent critics of the Department of Defense (DOD) are familiar to most of those associated with, and those within, DOD since the mid-1960's. Much of this public criticism focused on DOD's management and methods of acquiring major weapon systems. In 1969, the Secretary of Defense, who was also critical but not publicly vituperous, commissioned a Blue Ribbon Defense Panel to assess the DOD's acquisition management policy and procedures and to make recommendations for improvements. A section of the Panel's 1970 Report^{(1)*} pertained to test and evaluation. Some relevant excerpts from this Report are:

"It has been customary to think of operational test and evaluation in terms of physical testing (under various designations such as operational suitability testing, employment testing or field experimentation). Operational testing is a very important activity (which has often been done poorly), but it is emphasized that the goal is operational evaluation and that physical testing is only one means of performing operational evaluation. This is an important point since it is often argued that operational testing must await production of an adequate number of operationally-configured systems; and by this time it is too late to use the information gathered to help decide whether to produce the new system or even to influence in any significant way the nature of the system procured."

"...an effective program of operational test and evaluation must start with the earliest requirements and continue...for the life of the system. It should be pointed out that to conduct this lifetime of operational test and evaluation it is not necessary to conduct a different type of testing to fulfill each purpose and satisfy each 'customer'. There is a great deal of overlapping, and in large measure a generalized program of operational test and evaluation can assist with all purposes."

Responding to the Panel's recommendations, the Secretary of Defense (SECDEF) promulgated broad policy concerning the acquisition of major

* Superscript numbers in parentheses refer to references listed at the end of this report. See the Table of Contents for page number.

defense systems in July 1971.⁽²⁾ His guidance concerning test and evaluation was explicit.

"Test and evaluation shall commence as early as possible. A determination of the operational suitability, including logistic support requirements, will be made prior to large scale production commitments, making use of the most realistic test environment possible and the best representation of future operational systems available. The results of this operational testing will be evaluated and presented to the Defense Systems Acquisition Review Council at the time of the production decision."

Historically, in the services and the Navy in particular, operational test and evaluation has been downstream of any major decision point in the acquisition process. As such, operational test and evaluation has been directed more to determining how suitable the system or equipment was and, given it's determined degree of suitability, how best to use it rather than contributing to the decision whether the system or equipment should be acquired in the first place. Thus, operational test and evaluation generally followed the decision to go into production and was conducted just prior to or simultaneously with fleet introduction. In all too many instances, operational test and evaluation was then accomplished in an environment or under conditions which had little resemblance to actual fleet use and was often conducted by an agency which was at least restricted in its concept of fleet utilization. The Blue Ribbon Defense Panel recognized these shortcomings. It saw that the early and proper application of operational test and evaluation could be a powerful tool to be used in deciding whether the development of a system warranted proceeding to a subsequent phase of the acquisition process. SECDEF was explicit in his concurrence in the Panels' recommendation.

Policy, to be effective, must be adequately implemented.

Shortly before SECDEF released his acquisition policy directive, he established the Deputy Director of Defense Research and Engineering (Test and Evaluation) (DDT&E).⁽³⁾ The latter has been tasked to monitor all test and evaluations conducted by the services for major defense weapon systems and any other programs as considered necessary. He reports the results of his assessment of the adequacy and suitability of operational test and evaluation of a system under development directly to SECDEF as well as to the Defense Systems Acquisition Review Council whenever an acquisition decision point has been reached. With such assigned responsibilities, an aggressive DDT&E exerts considerable influence on SECDEF's decision to proceed from one acquisition phase to the next.

Additional impetus in regards to the requirement for test and evaluation of the S-3A project resulted from receipt of a Government Accounting Office (GAO) Report dated 29 March 1971⁽⁴⁾, which was made available to the Office of the Chief of Naval Operations (CNO) on 16 July 1971⁽⁵⁾. In a section on matters for consideration by the Preparedness Investigating Subcommittee, Senate Committee on Armed Services, the GAO recommended that "consideration should be given to conducting an assessment of the S-3A, independent of program management, prior to the production decision". Although CNO's formal response⁽⁵⁾ addressed the assignment of qualified witnesses to observe significant initial development test and evaluation, it is

known that he informally advised the subcommittee that a major revision of the test and evaluation program for the S-3A project was forthcoming.

THE PROBLEM

The contract for the design, development and incremental production of the S-3A weapon system was awarded on 1 August 1969. It is a multibillion dollar, multiyear, fixed price incentive contract of considerable complexity, containing many interdependent and inter-related clauses. The signing of the contract was the culmination of much planning, design and development effort and negotiation. A significant feature of the contract is the incorporation of five specific milestones which must be satisfactorily completed prior to proceeding to the next phase of the acquisition project. A summary of the contract schedule, showing these milestones, is presented in Figure 1. One of the first two milestones, is a laboratory demonstration of the complete antisubmarine warfare avionics suite. The other is a thirty minute "first flight" of the aircraft less the avionics suite. These two milestones provided the basis for the initial production decision scheduled for not later than 1 April 1972 and for the initiation of Navy development testing. In conjunction with development testing, a Navy Preliminary Evaluation (NPE) * and a Navy Preliminary Appraisal (NPA) were each designated contractual milestones. The NPE provided the basis for the full scale production decision to occur not later than 1 August 1972 and the NPA signaled the readiness to commence Board of Inspection and Survey (BIS) trials on 9 October 1973. The

* The reader is requested to refer to the Glossary for definitions of Navy test and evaluation related terminology as used herein.

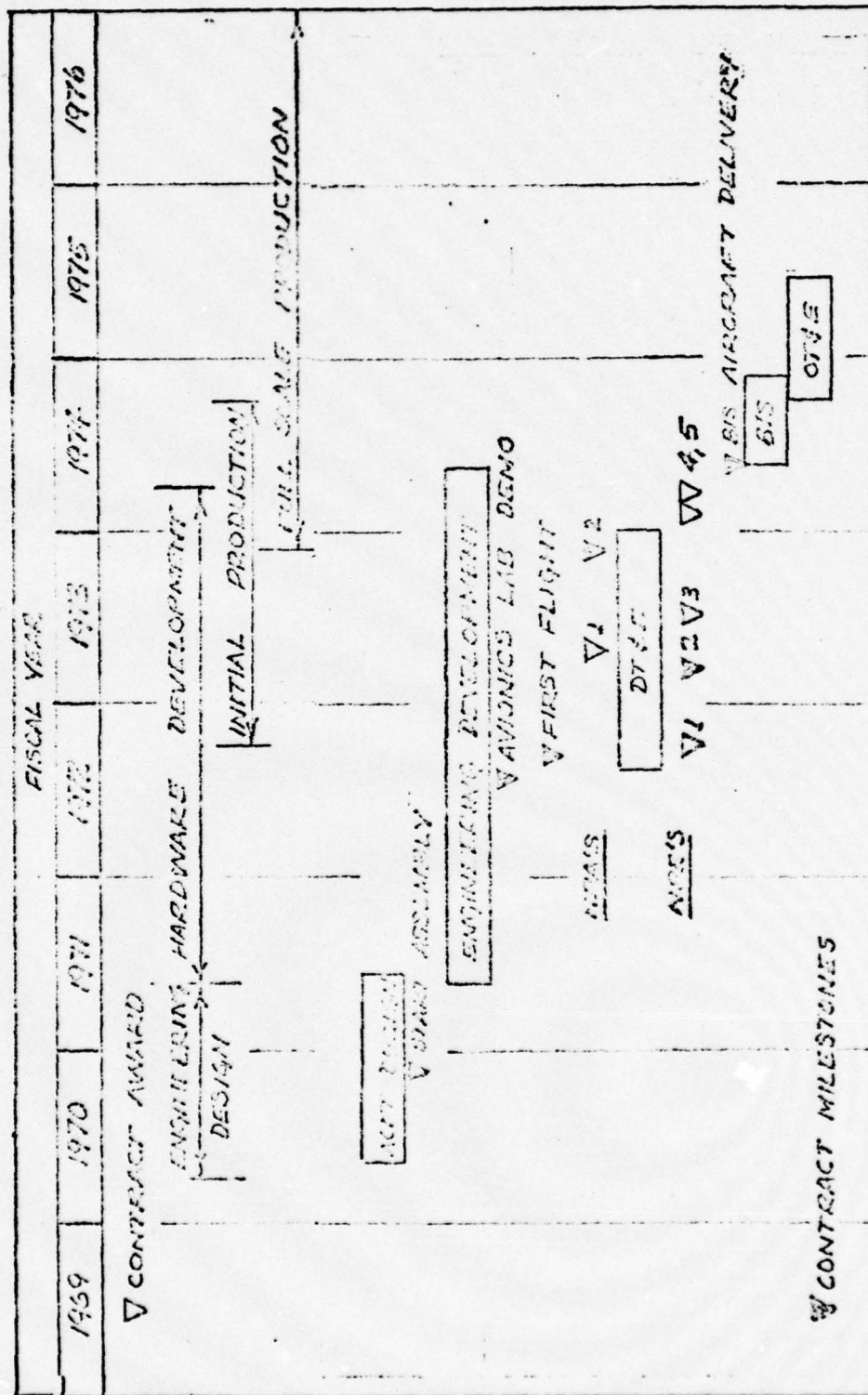


FIGURE 1. ORIGINAL CONTRACT SCHEDULE

final milestone was the delivery of a production configured complete aircraft and avionic system for the commencement of the BIS trials. Completion of this milestone was seen as confirmation of the technical and schedule adequacy of the project as it entered into full scale production. Operational test and evaluation was scheduled to commence on 15 March 1974, nearly a year after the decision to go into full scale production had been made.

After two years of progress under the terms of the contract, the Chief of Naval Operations (CNO), responding to a strong recommendation by DDT&E, directed that operational test and evaluation of the S-3A system be initiated as "early as the schedule would permit."⁽⁶⁾ CNO directed further, that there should be no significant cost increase or schedule delay associated with early initiation of operational test and evaluation. And finally, he directed that the operational evaluation (operational test and evaluation) be conducted by the Commander, Operational Test and Evaluation Force (COMOPTEVFOR).

Thus, in August 1972, the S-3A Project Manager was faced with a major revision of his contract schedule for the purpose of accommodating early initiation of test and evaluation while constrained by the contract, cost and schedule. An additional set of constraints were added; operational test and evaluation was to be accomplished by an independent agency and the results of the operational test and evaluation would be used by DDT&E in a recommendation to proceed into full scale production. This, therefore, is the problem which is the basis for this study and report effort.

DISCUSSION AND ANALYSIS

The Contract

The most significant aspect of the problem--accommodating for the increased emphasis on operational test and evaluation--confronting the S-3A Project Manager in August 1972, was the fragility of the basic contract. Although the contract had been in negotiations for almost a year prior to award on 1 August 1969, during which it had had the benefit of thorough planning and was subjected to more than considerable evaluation by both the contractor and the government, various small difficulties began to surface shortly thereafter. In sum, the contractor had to bear the weight of these difficulties; inflation, wage increases, increased material costs, scarcities in some basic skills, problems which culminated in minor schedule slippage passing from subcontractors who were faced with the same difficulties as the prime contractor. Since none of these difficulties, individually, had resulted in major problems for the contractor, which is taken as evidence of thorough and adequate planning, the aggregate was such that the contractor was tending to be guardedly defensive by August 1971. This was well known in the Project Office.

One of the options the Project Manager considered in an effort to initiate operational test and evaluation earlier than originally scheduled was to renegotiate the contract. He stated, however, that after considering all the ramifications, this option was discarded due to its effect on the cost of acquisition. The contractor had by then two years of experience with the contract and could be

expected to learn from this experience. This learning, it was believed, would be translated into increased cost. That the Project Office was seriously concerned about the fragility of the contract is evidenced by reference to the subject in numerous letters and memoranda, an example of which from a Memorandum for Record is:⁽⁷⁾

"If such additional tests [operational test and evaluation] are forced on the program they will more than likely result in fracturing the contract and cause a delta cost far in excess of the previously noted."

The following is quoted from another Memorandum for Record⁽⁸⁾:

"...it must be remembered that in every case the new testing to be introduced is to be only to the extent that it does not cause a substantial impact on the S-3A program, or give cause for the contractor to claim interference to the extent that the contract has been violated"

As a result of the initial assessment of the impact of providing for early operational test and evaluation, it was concluded in the Project Office "that any change to the test program which would give the contractor cause to claim interference or which would otherwise result in renegotiation of the contract shall be avoided".⁽⁹⁾

A recommendation based on this conclusion was approved by the Secretary of the Navy (SECNAV)⁽¹⁰⁾. The research accomplished for this study has disclosed that no significant change to the basic contract to accommodate for early operational test and evaluation has been advocated or proposed subsequent to SECNAV's approval of the aforementioned recommendation.

The Cost

As was noted in the first of the quotes contained in the previous discussion pertaining to the contract, cost associated with the addition of early operational test and evaluation was a principle concern to all involved. At the time the contract was awarded, the cost of the operational evaluation (OPEVAL), conducted by COMOPTEVFOR and scheduled for the period 1 February 1974 through 1 October 1974, was to be funded by CNO with the funds being provided directly to COMOPTEVFOR. In addition, training for the OPEVAL flight crews was to be provided by the Navy Test Pilot crews conducting BIS trials during the period 15 October 1973 through 15 June 1974 from funds provided to the Commander, Naval Air Test Center (COMNAVAIRTESTCEN), again by CNO. In essence then, as originally intended, the S-3A project was not the source of funding for operational test and evaluation.

The S-3A project was, however, responsible for funding the development test and evaluation under which completion of all contractual milestones was to occur (refer to Figure 1). Although project funds for development test and evaluation were included as separate line items or subelements thereof; such as the Naval Air Systems Command Integrated Test Facility (ITF), the original cost breakdown identified as contractor development test and evaluation were by fiscal year, in millions of dollars⁽¹⁰⁾:

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
2.73	3.09	3.00	.45

With the decision to conduct operational test and evaluation earlier than originally scheduled came the requirement to train the OPEVAL flight crews earlier than originally planned as well as expand the original test and evaluation program. The Navy test crews who were to conduct the development test and evaluations, the NPE's and NPA's, were trained by the contractor at a cost to the government which was negotiated in the contract and which is included in the cost figures above. These test crews, limited in number, would have neither the time nor opportunity to train the OPEVAL crews. The first development configured aircraft was delivered to the Navy for exclusive testing in September 1972, a date too late to be considered acceptable to start to train OPEVAL crews. In addition, the scheduled Navy development tests would have to slip if Navy crews were required to train the OPEVAL crews.

Taking the foregoing into account, the only viable option in regard to training the OPEVAL crews was to provide contractor training, at a cost to the government. It was recognized that an expansion of the originally scheduled development test program would have to be negotiated with the contractor in addition to providing training for the OPEVAL crews. When all things had been considered, it was decided that the S-3A project would be responsible for funding the early initiation of operational test and evaluation. A request for quote submitted to the contractor to accommodate the training of two additional three man flight crews and expansion of the development test program to provide for approximately 120 hours of operational test and evaluation resulted in the contractor's estimates of .42 million dollars

for training and 1.43 million for expansion of the test program. It was concluded that an estimated cost for early initiation of operational test and evaluation of 1.87 million dollars, less than one percent of the total estimated cost of acquisition and ownership was acceptable.

The Schedule

The schedule, modified and expanded to accommodate initial operational test and evaluation, commencing with the first two contractual milestones, the laboratory avionics demonstration and the first flight, was conditionally approved by SECNAV and concurred in by DDT&E in early November 1971. It was then immediately submitted to the contractor for comment. In late November 1971, after about two weeks for analysis, the contractor informed the government that it was willing to accept the revised schedule and provide the training required for the OPEVAL crews at its previously quoted cost. A summary of the revised schedule is presented in Figure 2. Final approval of the revised schedule by SECNAV and DDT&E was accomplished on 17 December 1971⁽¹¹⁾. It is interesting to note that the revised schedule did not interfere with the contractual milestones, an objective in planning for early initiation of operational test and evaluation, in any way.

An Update

As of the time this section of this report is being drafted, all contractual milestones have been satisfactorily completed. The

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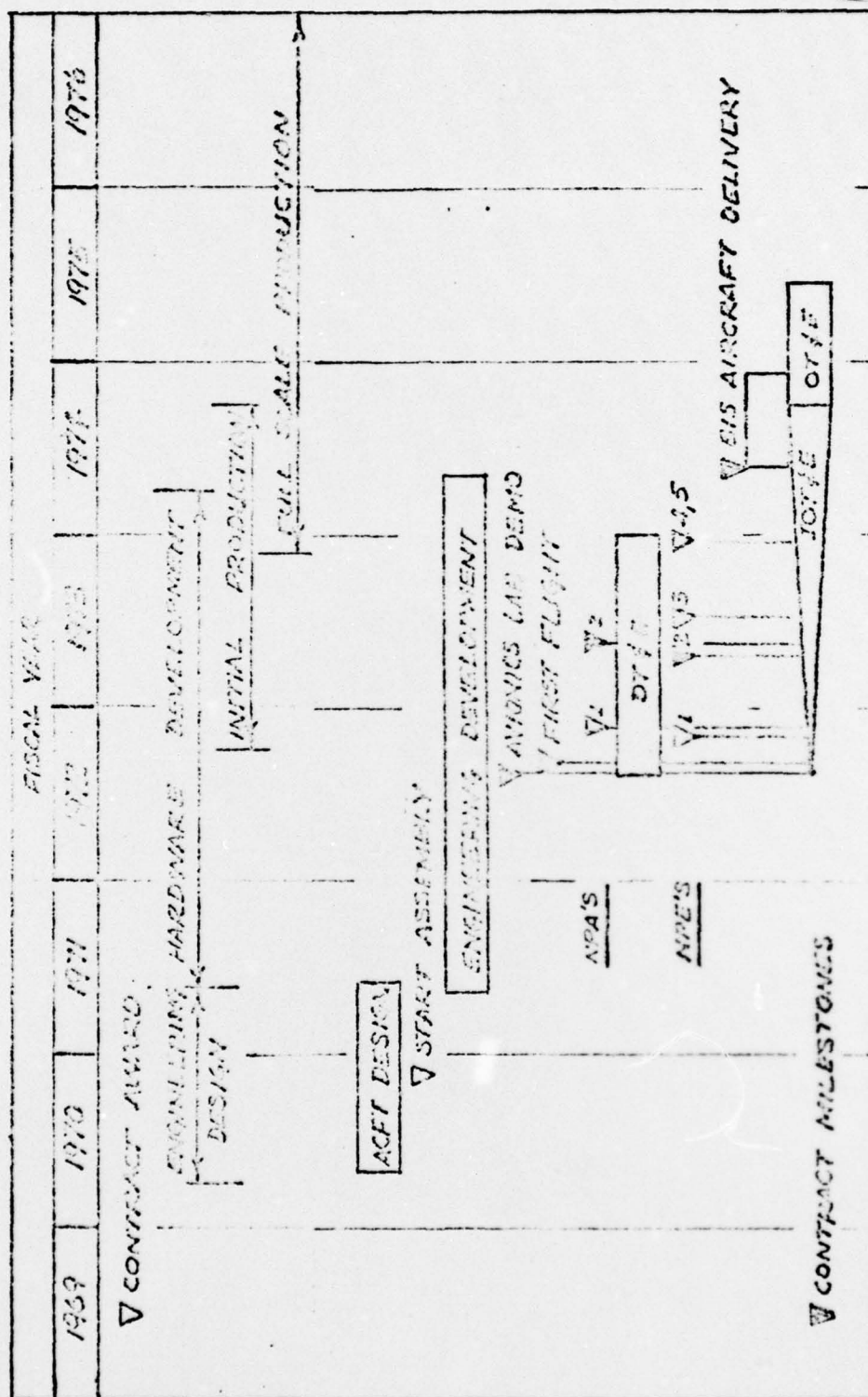


FIGURE 2. REVISED CONTRACT SCHEDULE

Final contract milestone, delivery of the first production configured aircraft to the BIS was accomplished on schedule, on 9 October 1973. All Navy development testing, the NPE's and NPA's, and the associated operational test and evaluation, have been completed on or ahead of schedule. Using the carrier suitability demonstration, which involved 288 field and shipboard arrestments and 39 shipboard catapult launches, as an example, it was completed three months early. COMNAVAIRTESTCEN, who was responsible for the development portion of the carrier suitability demonstration, reported (12) that; during the seven month period of the demonstration:

1. A total of 24 minor deficiencies were discovered, most of which were corrected by completion of the demonstration.
2. An absolute minimum of avionics equipment and component failures were experienced.
3. Catapult flying qualities are "very good".
4. Fuel and hydraulic leaks were nonexistent.
5. The S-3A airplane "will be structurally and functionally suitable for carrier operations following completion of BIS trials".

Simultaneously, from this same carrier suitability demonstration, COMOPTEVFOR concluded (13) That:

"Based on the 'limited' data, nothing was revealed during the demonstration tests which would inhibit the operational suitability of the S-3A in a carrier environment."

The Quality and Consistency of Data

In contrast to the foregoing wherein it appears that both COMNAVAIRTESTCEN and COMOPTEVFOR agree on the results of the concurrent but independent test and evaluation, such is not always the case. There have been several instances of divergent conclusions resulting from the same test or series of tests and the same data. An early example of this divergence came to light as a result of evaluating the flying qualities and performance in the power approach configuration. A Test Center pilot (a qualified Navy Test Pilot) acquiring data for the NPE, concluded that the aircraft characteristics during approach to stall were satisfactory and meet the requirements of the appropriate specification. The OPTEVFOR pilot, who was not a qualified test pilot, reported that the aircraft was unsafe in the power approach configuration during approach to stall. The divergence was resolved after it was realized that the OPTEVFOR pilot had accumulated a total of only eight flight hours of jet flying time, all of which was in the S-3A aircraft. He was comparing his reaction to the S-3A to that of a propeller powered S-2E in which he had over two thousand flight hours. His preliminary report was cancelled subsequent to his accumulation of more flight time and consequently an increase in his confidence in the S-3A aircraft.

The most recent example of divergent conclusions, and for which full resolution is still pending at this writing, resulted from a series of tests to demonstrate the compatibility of certain aircraft

avionic components with the Versatile Avionics Shop Test (VAST) system. Briefly, the VAST system is a computerized system designed to isolate faults in an avionic component. A total of sixty five weapon replacement assemblies (WRA) were subjected to concurrent developmental and operational tests. With respect to the development test criteria, the VAST system correctly identified the fault, or lack of fault, in thirteen WRA's, in sixty two instances. Although the VAST failed to correctly diagnose the fault in three of the WRA's, further analysis revealed that such incorrect fault isolation was within the tolerance of performance for the VAST system. According to the operational test criteria, however, seventeen suitability deficiencies were recorded, only three of which relate to the three incorrectly diagnosed faults previously mentioned. It appears to the Project Office that the criteria for the two types of test is sufficiently similar to preclude disagreement between results and conclusions. It is the S-3A Project Manager's conclusion that the disparity between the results is derived from the OPTEVFOR test personnel's lack of formal training regarding test and evaluation. Additionally, the current OPTEVFOR test team has only limited operational antisubmarine warfare experience. He has recommended that qualified Navy Test Pilots and crews be assigned to COMOPTEVFOR for satisfactory completion of the remaining operational test and evaluation of the S-3A weapon system.

The disparity between the results of concurrent development and operational test and evaluation, is not considered to be as a result

of early initiation of operational test and evaluation. Divergence of conclusions between those responsible for performing and reporting development tests and those performing and reporting operational tests have been previously experienced. But, in the past, the determination of operational unsuitability has been made after the system was in production; when it was too late to affect the production decision. On occasion, the determination of operational unsuitability has resulted in costly modifications to the system to insure that the system provided the fleet with the capability which was to have been provided. On other occasions, where modification was too costly or otherwise infeasible, the fleet suffered reduced capability, usually with a system that was difficult or costly to maintain. It was this past history which the Blue Ribbon Defense Panel observed and to forestall similar occurrences in the future, recommended that operational test and evaluation be initiated in the acquisition process as soon as possible.

The divergence of conclusions resulting from concurrent development and operational testing does indicate a need for coordination between the test agencies involved. A loss of independence is not being advocated nor is inference being made that the conclusions reached by different test agencies should be identical. However, if the test criteria are coordinated and discussed by those with similar technical qualifications to the degree that the test plans are coordinated, conflict between conclusions may be reduced to minor proportions or eliminated altogether.

There is no evidence that there was a lack of coordination between representatives from COMNAVAIRTESTCEN and COMOPTEVFOR. Nor is there evidence that there was sufficient coordination. There is evidence that lack of experience, technical qualification and full appreciation of the test objectives has resulted in conflict. More deliberate coordination may ameliorate the existence of conflict in the future.

CONCLUSIONS

It is concluded that for the S-3A weapon system acquisition:

- (1. Incorporation of operational test and evaluation earlier than originally contractually scheduled was accomplished:
 - a. In such a manner as to have no effect on the terms of the basic contract.
 - b. At a cost of less than one percent of the total estimated cost of acquisition and ownership.
 - c. By making a relatively minor revision to the original contract schedule.
- (2. A possible lack of coordination between the development test agency and the operational test agency has resulted in conflicting conclusions drawn from results of concurrent testing.

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7. Secretary of the Navy Instruction 5430.67. Assignment of Responsibility for Research, Development, Test and Evaluation. 29 June 1964.
8. Public Law 92-156. Armed Forces Appropriations Authorization-1972, Sec 506. 17 November 1971.

GLOSSARY

Development Test and Evaluation (DT&E). Conducted to demonstrate: that the engineering design is complete; that the design risks have been minimized; that the system will meet specifications and military requirements; and that there is assurance that it is producible within forecast cost and time limitations. Performed by or for the developing agency which emphasized the technological and engineering aspects of the system, subsystem or equipment items. Normally accomplished under structured or strictly controlled conditions.

Operational Test and Evaluation (OT&E). Conducted to determine, for the prospective system: its military utility, operational effectiveness and operational suitability (including reliability, maintainability and logistic and training requirements); the need for any modifications; and requirements, doctrine and tactics for its employment. It may also provide data to support or verify material in operating instructions, publications and handbooks. Performed by operational personnel who focus on the service suitability (including operational effectiveness, reliability, maintainability and supportability) of, and the development of, optimum operational tactics for systems and equipment being developed for service use.

Initial Operational Test and Evaluation (IOT&E). That initial phase of OT&E which is accomplished prior to the first major production

decision and must be adequate to provide an estimate of expected system operational effectiveness and suitability (including reliability, maintainability and logistic and training requirements). Pilot or early production items will be employed for IOT&E wherever practiced.

Concurrent Test and Evaluation(CT&E). Conducted under joint sponsorship of the developing agency, who is responsible for funding and, in the U.S. Navy, the Commander, Operational Test and Evaluation Force (COMOPTEVFOR). Authority to conduct CT&E will be granted by the CNO on case basis. Accomplished by combining the requirements of developmental, initial and follow on operational test and evaluation providing the economies of the combined approach outweigh the advantages of a more complete, independent DT&E and OT&E program.

Board of Inspection and Survey (BIS) Trials. Trials conducted by or under the direction of the BIS to determine contractual compliance with Navy specifications and conformance with mission requirements established by the CNO. Trials are normally separate and distinct relative to DT&E and OT&E.

Navy Preliminary Evaluation (NPE). From one to five phases, each consisting of one or more flights, and normally comprise DT&E. Conducted to determine: at the earliest possible opportunity, the combat or mission potential and gross deficiencies of an aircraft and thereby enable an estimate of the degree to which operational requirements will be met; to identify the need for and allow for

early correction of deficiencies; to evaluate changes incorporated, and; an estimate when the aircraft will be suitable for BIS trials.

Navy Preliminary Appraisal (NPA). An element of DT&E developed for the S-3A program to provide a cost effective method of conducting an assessment of the antisubmarine warfare (ASW) avionics suite using a P-3C aircraft as a flying test bed. Specifically, conducted to determine: a confidence level that final design objectives for the S-3A weapon system can be met for the ASW mission; to obtain, in an operational environment, a preliminary operational evaluation of the avionics suite, and, to perform a technical assessment of the equipment prior to installation in the S-3A aircraft.